

Claims

[c1] What is claimed is:

1. A method of manufacturing a triode field emission cold cathode device having randomly distributed field emission emitters comprising the steps of:

- providing a substrate (10);
- depositing a first conductive layer (11) on the substrate;
- spraying the preceding layer with a random pattern of masking material (20);
- depositing an insulating layer (13) on the masked preceding layer;
- depositing a second conductive layer (14) on the insulating layer; and
- removing the masking material.

[c2] 2. The method of claim 1, further comprising the step of depositing an emitter material (16) after the removing step.

[c3] 3. The method of claim 2, wherein the depositing step comprises printing, spin coating, or direct growth.

[c4] 4. The method of claim 2, where the emitter material

comprises diamond, carbon nanotubes, LaB₆, Si, or Mo.

- [c5] 5. The method of claim 1, where the masking material can be dissolved in water or solvents.
- [c6] 6. The method of claim 1, wherein the masking material is either a form of solid particles, liquid droplets, or a combination of solid particles and liquid droplets.
- [c7] 7. The method of claim 1, wherein the masking material is photosensitive material, plastic, glass, metal or ceramic particles.
- [c8] 8. The method of claim 1, wherein the spraying step comprises dusting, sprinkling, or smoking.
- [c9] 9. The method of claim 1, further comprising the step of depositing a catalyst layer (12) on the first conductive layer (11), prior to the spraying step, for growing an emitter material (16).
- [c10] 10. The method of claim 9, wherein the catalyst layer is Ni, Cu, Ag, Co, Fe, or diamond-seeded film.
- [c11] 11. The method of claim 1, where the first conductive layer comprises a hardening material and further comprising the step of hardening the first conductive layer.
- [c12] 12. The method of claim 11, where the hardening mate-

rial is a metal-containing compound.

[c13] 13. The method of claim 11, where the hardening material is prepared by a sol-gel method.

[c14] 14. The method of claim 11, where the hardening material is a mixture of conductive powders and polymers.

[c15] 15. The method of claim 11, where the hardening step comprises either radiation curing or sol-gel processing.

[c16] 16. The method of claim 1, further comprising the steps of depositing a photosensitive layer, exposing the photosensitive layer, and developing the photosensitive layer.

[c17] 17. A method of manufacturing a triode field emission cold cathode device having randomly distributed field emission emitters comprising steps for:
 randomly masking conductive material; and
 removing the masking material.

[c18] 18. A method of manufacturing a triode field emission cold cathode device having randomly distributed field emission emitters comprising the steps of:
 spraying a conductive layer with a random pattern of masking material; and
 removing the masking material.

- [c19] 19. An addressable field emission array, wherein each addressable pixel comprises randomly distributed field emission emitters.
- [c20] 20. The addressable field emission array of claim 19, wherein the randomly distributed field emission emitters are manufactured using a random pattern of masking material.
- [c21] 21. A field emission array having pixels with randomly distributed field emission emitters, comprising:
- a substrate (10);
 - a first conductive layer (11) in contact with the substrate;
 - emitter material in contact with the preceding layer;
 - an insulating layer (13) in contact with the preceding layer having openings randomly disposed through the insulating layer and in registration with the emitter material; and
 - a second conductive layer (14) in contact with the insulating layer and having openings disposed through the second conductive layer in registration with the openings in the insulating layer;
- wherein the emitter material is exposed through the openings in the insulating layer and the openings in the second conductive layer.

[c22] 22. The field emission array of claim 21, further comprising a catalyst layer in contact with the first conductive layer.

[c23] 23. The field emission array of claim 21, where the emitter material is sintered into the preceding layer.